



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/895,511	06/29/2001	Ted Liang	P11354	8234
59796	7590	10/17/2008	EXAMINER	
INTEL CORPORATION			ZERVIGON, RUDY	
c/o INTELLEVATE, LLC				
P.O. BOX 52050			ART UNIT	PAPER NUMBER
MINNEAPOLIS, MN 55402			1792	
			MAIL DATE	DELIVERY MODE
			10/17/2008	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	09/895,511	LIANG ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Rudy Zervigon	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

1) Responsive to communication(s) filed on 28 July 2008.

2a) This action is **FINAL**.                            2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

4) Claim(s) 1,4-12,18,20-23 and 25-33 is/are pending in the application.

4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.

5) Claim(s) \_\_\_\_\_ is/are allowed.

6) Claim(s) 1,4-12,18,20-23 and 25-33 is/are rejected.

7) Claim(s) \_\_\_\_\_ is/are objected to.

8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) All    b) Some \* c) None of:

1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

1) Notice of References Cited (PTO-892)

2) Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.

4) Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.

5) Notice of Informal Patent Application

6) Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on July 28, 2008 has been entered.

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1, 4-12, 18, 20-23, and 25-33 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Claims 1, 4-12, 18, 20-23, and 25-33 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: Applicant's claim to relative height or vertical positions is not elaborated with respect to a datum. The claimed "heights" can be measured from many numerous and arbitrary positions in both the prior art and in Applicant's not-to-scale drawings.

### ***Claim Rejections - 35 USC § 103***

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. Claims 1, 4-12, 18-20, 25, and 27-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Casey, Jr. et al (USPat. 6,042,738) as demonstrated by Baum, Aaron Wolf et al (US 5,684,360 A) in view of Parker; Norman W. et al. (US 4,818,872 A) and Fuji, Eiji et al (US 5,876,504 A).

Casey teaches an apparatus (Figure 1) including:

- i. A holder (26) to mount a substrate / mask (30) in a chamber (22) by a stage (24) disposed below said holder (26) – Regarding the particular identity of the article to be processed, it is well established that apparatus claims must be structurally distinguished from the prior art (In re Danley, 120 USPQ 528, 531 (CCPA 1959). "Apparatus claims cover what a device is, not what a device does ."(emphasis in original) Hewlett - Packard Co . v. Bausch & Lomb Inc ., 15 USPQ2d 1525, 1528 (Fed. Cir. 1990), MPEP – 2114). Further, a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).
- ii. A stage (24) adapted to position the holder in a chamber (22), and adapted to move in different directions (column 4, line 64 – column 5, line 3)
- iii. A pumping system ("vacuum chamber 22"; column 4, lines 31) adapted to evacuate the chamber (22)

- iv. A first electron column<sup>1</sup> imaging system (28, 54; column 4, lines 38-45; column 5, lines 5-10; Figure 1; column 3, lines 8-16, “image and mill the workpiece” to locate an opaque defect; column 4, lines 5-10; column 5, lines 5-10) in said chamber (22, see lines encompassing 54,28) and disposed at a first height vertically above (28) said holder (26) and over an opaque defect (column 3, lines 60-65) on said substrate (90; Figure 1)
- v. A gas delivery system (45, 34; column 5, lines 22-38) comprising a nozzle (45; Figure 1) disposed at a second height over said opaque defect at a tilt angle of 45-70 degrees (see Figure 1) from the vertical,to dispense a reactant gas (out of 45; Figure 1) and a carrier gas from a reservoir (36), wherein said second height is lower than said first height (see Figure )
- vi. A second electron column delivery system (32, 54, 56, 62, 64, 52/112; column 4, line 64 – column 5, line 12; column 5, line 63 - column 6, line 10) disposed at an angle (32 is at an angle offset from the vertical) over said holder and said opaque defect (column 3, lines 60-65) to direct electrons towards said reactant gas (out of 45; Figure 1) “bombardment, and without ion implantation or knock-on of atoms” – “methods of gas-assisted etching using an etching gas including bromine” (abstract) – claim 1, 25. It is noted that when the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01).
- vii. DUV/EUV mask / substrate (column 1, lines 35-45)
- viii. Chrome opaque defect (column 3, lines 3-4; line 55)

---

<sup>1</sup> Baum, Aaron Wolf et al (US 5,684,360 A) teaches the art-accepted definition of “electron beam column” (column

- ix. An ion focusing control system (18; column 4, lines 28-44) and scanning control system (62, column 4, lines 39-43) – claim 9
- x. An acceleration system (“JEOL Model 6400”) providing a low acceleration voltage (column 9, lines 20-25) – claim 11
- xi. A computer controller (50, 52/112, column 4, lines 38-45; column 7, lines 33-44; column 5, line 63 - column 6, line 10; column 7, lines 32-44) adapted to control the second electron column delivery system (32, 54, 56, 62, 64, 52/112; column 4, line 64 – column 5, line 12; column 5, line 63 - column 6, line 10) – claim 10, 12.
- xii. The gas delivery system (34; column 5, lines 22-38) is also adapted to “dispense a carrier gas towards said opaque defect”, “said gas comprises water or oxygen” (claim 29), “said gas comprises Xenon Fluoride (XeF2)” (claim 30) – Applicant’s claim 18, 29, 30 limitations are intended use claim requirements. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey,152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).
- xiii. Applicant’s claim 20 limitation of “the reactant gas absorbs to said opaque defect and becomes disassociated” are intended use claim requirements. Further, it has been held

that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP 2111.02).

Casey further teaches Casey's gas delivery system (45, 34; column 5, lines 22-38) and said electron delivery system (32, 54, 56, 62, 64, 52/112) are disposed on opposite sides (across the vertical axis) of said imaging system (28, 54) - claim 1, 25, and 31. See Figure 1.

Casey does not teach that Casey's first electron column (28; Figure 1; column 3, lines 8-16, "image and mill the workpiece"; column 4, lines 5-10; column 5, lines 5-10) is used to direct a first set of electrons towards a substrate.

Casey does not teach that Casey's second electron column delivery system (32, 54, 56, 62, 64, 52/112; column 4, line 64 – column 5, line 12; column 5, line 63 - column 6, line 10) is capable of "scanning" and direct electrons in a range of 0.3-3.0keV, wherein said electron beam has a tail diameter of 5-125nm (claim 9), and wherein said electron beam has an electron beam size smaller than 30% of the smallest critical defect (claim 31). However, the Examiner believes that Applicant's claim limitations of "wherein said electron beam has an electron beam size smaller than 30% of the smallest critical defect." are claim requirements of intended use of the pending apparatus claims. Indeed, the "electron beam size smaller than 30% of the smallest critical defect" is a feature that depends on the "smallest critical defect" of the article that is worked on

which is not considered part of the claimed apparatus. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP 2111.02).

Casey does not teach Casey's computer controller (50, 52/112, column 4, lines 38-45; column 7, lines 33-44; column 5, line 63 - column 6, line 10; column 7, lines 32-44) adapted to control the second electron column delivery system (32, 54, 56, 62, 64, 52/112; column 4, line 64 – column 5, line 12; column 5, line 63 - column 6, line 10) can control Casey's second electron column delivery system (32, 54, 56, 62, 64, 52/112; column 4, line 64 – column 5, line 12; column 5, line 63 - column 6, line 10) "dwell time", "scan rate", "refresh time", and "retrace time" because Casey does not teach that Casey's second electron column delivery system (32, 54, 56, 62, 64, 52/112; column 4, line 64 – column 5, line 12; column 5, line 63 - column 6, line 10) is capable of "scanning". However, Casey's computer controller (50, 52/112, column 4, lines 38-45; column 7, lines 33-44; column 5, line 63 - column 6, line 10; column 7, lines 32-44) is inherently capable of controlling "dwell time", "scan rate", "refresh time", and "retrace time" as evidenced from Casey's "scan generator element 62", "dwell registers 64" (column 4, line 40; column 7, line 55 – column 8, line 5), and processor 52/112 "to implement a digital raster pattern" (column 5, line 65). Applicant's claimed "times" and "rates" of moving are translated to Casey's control

element 58 to generate raster motions which have “dwell time”, “scan rate”, “refresh time”, and “retrace time” based on the desired milling instructions (column 6, lines 1-10; column 7, lines 45-54).

Casey does not teach that Casey’s gas delivery system (45, 34; column 5, lines 22-38) comprising a nozzle (45; Figure 1) with a diameter of 100-300 microns, a distance of 50-150 microns, and an angular dispersion of 5-25 degrees.

Parker teaches a “highly focused” scanning (“ion beam is scanned”; claim 1, ) electron column (4; Figure 1A; column 4; lines 13-23) used to direct a first set of electrons (10; Figure 1A; column 4; lines 13-23) towards a substrate (“targets”; column 2, lines ) for charge neutralization (claim 1, “second, charge neutralization mode”).

Fuji teaches a variably positioned gas injection nozzle (8; Figure 2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add Parker’s electron column to Casey’s apparatus and to optimize the operation of Casey’s apparatus to avoid damaging underlying layers of the processed substrate.

Motivation to add Parker’s electron column to Casey’s apparatus and to optimize the operation of Casey’s apparatus to avoid damaging underlying layers of the processed substrate is to minimize substrate damage as taught by Casey (column 9; lines 65-67) and for combining multiple beam sources into one apparatus as taught by Parker (column 3; lines 29-31) to image “with high spatial resolution” as taught by Parker (column 3; lines 33-35). Further, it is well established that the duplication of parts is obvious (In re Harza, 274 F.2d 669, 124 USPQ 378 (CCPA 1960) MPEP 2144.04). It would be obvious to those of ordinary skill in the art to optimize the operation of the claimed invention (In re Boesch, 617 F.2d 272, 205 USPQ 215

(CCPA 1980); *In re Hoeschele* , 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); *Merck & Co. Inc . v. Biocraft Laboratories Inc.* , 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied , 493 U.S. 975 (1989); *In re Kulling* , 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990), MPEP 2144.05).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace Casey and Parker's gas injector nozzle with Fuji's variably positioned gas injection nozzle (8; Figure 2).

Motivation to replace Casey and Parker's gas injector nozzle with Fuji's variably positioned gas injection nozzle (8; Figure 2) is for establishing laminar flow on the substrate as taught by Fuji (column 4, lines 35-40).

7. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Casey, Jr. et al (USPat. 6,042,738) as demonstrated by Baum, Aaron Wolf et al (US 5,684,360 A) in view of Parker; Norman W. et al. (US 4,818,872 A).

Casey teaches an apparatus (Figure 1) including:

i. A holder (26) to mount a substrate / mask (30) in a chamber (22) by a stage (24) disposed below said holder (26) – Regarding the particular identity of the article to be processed, it is well established that apparatus claims must be structurally distinguished from the prior art (*In re Danley*, 120 USPQ 528, 531 (CCPA 1959). "Apparatus claims cover what a device is, not what a device does ." (emphasis in original) *Hewlett - Packard Co . v. Bausch & Lomb Inc .*, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990), MPEP – 2114). Further, a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art

apparatus" if the prior art apparatus teaches all the structural limitations of the claim.

Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

- ii. A stage (24) adapted to position the holder in a chamber (22), and adapted to move in different directions (column 4, line 64 – column 5, line 3)
- iii. A pumping system ("vacuum chamber 22"; column 4, lines 31) adapted to evacuate the chamber (22)
- iv. A first electron column<sup>2</sup> imaging system (28, 54; column 4, lines 38-45; column 5, lines 5-10; Figure 1; column 3, lines 8-16, "image and mill the workpiece" to locate an opaque defect; column 4, lines 5-10; column 5, lines 5-10) in said chamber (22, see lines encompassing 54,28) and disposed vertically above (28) said holder (26) and over an opaque defect (column 3, lines 60-65) on said substrate (90; Figure 1)
- v. A gas delivery system (45, 34; column 5, lines 22-38) comprising a nozzle (45; Figure 1) disposed over said opaque defect at a tilt angle of 45-70 degrees (see Figure 1) from the vertical, to dispense a reactant gas (out of 45; Figure 1) and a carrier gas from a reservoir (36)
- vi. A second electron column delivery system (32, 54, 56, 62, 64, 52/112; column 4, line 64 – column 5, line 12; column 5, line 63 - column 6, line 10) disposed at an angle (32 is at an angle offset from the vertical) over said holder and said opaque defect (column 3, lines 60-65) to direct electrons towards said reactant gas (out of 45; Figure 1) "bombardment, and without ion implantation or knock-on of atoms" – "methods of gas-assisted etching using an etching gas including bromine" (abstract) – claim 1, 25. It is noted that when the

structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01).

- vii. DUV/EUV mask / substrate (column 1, lines 35-45)
- viii. Chrome opaque defect (column 3, lines 3-4; line 55)
- ix. An ion focusing control system (18; column 4, lines 28-44) and scanning control system (62, column 4, lines 39-43) – claim 9
- x. An acceleration system (“JEOL Model 6400”) providing a low acceleration voltage (column 9, lines 20-25) – claim 11
- xi. A computer controller (50, 52/112, column 4, lines 38-45; column 7, lines 33-44; column 5, line 63 - column 6, line 10; column 7, lines 32-44) adapted to control the second electron column delivery system (32, 54, 56, 62, 64, 52/112; column 4, line 64 – column 5, line 12; column 5, line 63 - column 6, line 10) – claim 10, 12.
- xii. The gas delivery system (34; column 5, lines 22-38) is also adapted to “dispense a carrier gas towards said opaque defect”, “said gas comprises water or oxygen” (claim 29), “said gas comprises Xenon Fluoride (XeF<sub>2</sub>)” (claim 30) – Applicant’s claim 18, 29, 30 limitations are intended use claim requirements. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably

---

<sup>2</sup> Baum, Aaron Wolf et al (US 5,684,360 A) teaches the art-accepted definition of “electron beam column” (column

distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

xiii. Applicant's claim 20 limitation of "the reactant gas absorbs to said opaque defect and becomes disassociated" are intended use claim requirements. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

Casey does not teach that Casey's first electron column (28; Figure 1; column 3, lines 8-16, "image and mill the workpiece"; column 4, lines 5-10; column 5, lines 5-10) is used to direct a first set of electrons towards a substrate.

Casey does not teach that Casey's second electron column delivery system (32, 54, 56, 62, 64, 52/112; column 4, line 64 – column 5, line 12; column 5, line 63 - column 6, line 10) is capable of "scanning" and electron beam size smaller than 30% of the smallest critical defect. However, the Examiner believes that Applicant's newly added amended claim limitations of "an electron beam size smaller than 30% of the smallest critical defect." are claim requirements of intended use of the pending apparatus claims. Indeed, the "electron beam size smaller than 30% of the

smallest critical defect" is a feature that depends on the "smallest critical defect" of the article that is worked on which is not considered part of the claimed apparatus. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP 2111.02).

Casey does not teach Casey's computer controller (50, 52/112, column 4, lines 38-45; column 7, lines 33-44; column 5, line 63 - column 6, line 10; column 7, lines 32-44) adapted to control the second electron column delivery system (32, 54, 56, 62, 64, 52/112; column 4, line 64 - column 5, line 12; column 5, line 63 - column 6, line 10) can control Casey's second electron column delivery system (32, 54, 56, 62, 64, 52/112; column 4, line 64 - column 5, line 12; column 5, line 63 - column 6, line 10) "dwell time", "scan rate", "refresh time", and "retrace time" because Casey does not teach that Casey's second electron column delivery system (32, 54, 56, 62, 64, 52/112; column 4, line 64 - column 5, line 12; column 5, line 63 - column 6, line 10) is capable of "scanning". However, Casey's computer controller (50, 52/112, column 4, lines 38-45; column 7, lines 33-44; column 5, line 63 - column 6, line 10; column 7, lines 32-44) is inherently capable of controlling "dwell time", "scan rate", "refresh time", and "retrace time" as evidenced from Casey's "scan generator element 62", "dwell registers 64" (column 4, line 40; column 7, line 55 - column 8, line 5), and processor 52/112 "to implement a digital raster pattern" (column

5, line 65). Applicant's claimed "times" and "rates" of moving are translated to Casey's control element 58 to generate raster motions which have "dwell time", "scan rate", "refresh time", and "retrace time" based on the desired milling instructions (column 6, lines 1-10; column 7, lines 45-54).

Parker teaches a "highly focused" scanning ("ion beam is scanned"; claim 1, ) electron column (4; Figure 1A; column 4; lines 13-23) used to direct a first set of electrons (10; Figure 1A; column 4; lines 13-23) towards a substrate ("targets"; column 2, lines ) for charge neutralization (claim 1, "second, charge neutralization mode").

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add Parker's electron column to Casey's apparatus and to optimize the operation of Casey's apparatus to avoid damaging underlying layers of the processed substrate.

Motivation to add Parker's electron column to Casey's apparatus and to optimize the operation of Casey's apparatus to avoid damaging underlying layers of the processed substrate is to minimize substrate damage as taught by Casey (column 9; lines 65-67) and for combining multiple beam sources into one apparatus as taught by Parker (column 3; lines 29-31) to image "with high spatial resolution" as taught by Parker (column 3; lines 33-35). Further, it is well established that the duplication of parts is obvious (In re Harza, 274 F.2d 669, 124 USPQ 378 (CCPA 1960) MPEP 2144.04). It would be obvious to those of ordinary skill in the art to optimize the operation of the claimed invention (In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980); In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); Merck & Co. Inc. v. Biocraft Laboratories Inc., 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493

U.S. 975 (1989); In re Kulling , 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990), MPEP 2144.05).

8. Claims 25, and 27-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Casey, Jr. et al (USPat. 6,042,738) as demonstrated by Baum, Aaron Wolf et al (US 5,684,360 A) in view of Parker; Norman W. et al. (US 4,818,872 A).

Casey teaches an apparatus (Figure 1) including:

- i. A holder (26) to mount a substrate / mask (30) in a chamber (22) by a stage (24) disposed below said holder (26) – Regarding the particular identity of the article to be processed, it is well established that apparatus claims must be structurally distinguished from the prior art (In re Danley, 120 USPQ 528, 531 (CCPA 1959). "Apparatus claims cover what a device is, not what a device does ."(emphasis in original) Hewlett - Packard Co . v. Bausch & Lomb Inc ., 15 USPQ2d 1525, 1528 (Fed. Cir. 1990), MPEP – 2114). Further, a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).
- ii. A stage (24) adapted to position the holder in a chamber (22), and adapted to move in different directions (column 4, line 64 – column 5, line 3)
- iii. A pumping system ("vacuum chamber 22"; column 4, lines 31) adapted to evacuate the chamber (22)

- iv. A first electron column<sup>3</sup> imaging system (28, 54; column 4, lines 38-45; column 5, lines 5-10; Figure 1; column 3, lines 8-16, “image and mill the workpiece” to locate an opaque defect; column 4, lines 5-10; column 5, lines 5-10) in said chamber (22, see lines encompassing 54,28) and disposed vertically above (28) said holder (26) and over an opaque defect (column 3, lines 60-65) on said substrate (90; Figure 1)
- v. A gas delivery system (45, 34; column 5, lines 22-38) comprising a nozzle (45; Figure 1) disposed over said opaque defect at a tilt angle of 45-70 degrees (see Figure 1) from the vertical,to dispense a reactant gas (out of 45; Figure 1) and a carrier gas from a reservoir (36)
- vi. A second electron column delivery system (32, 54, 56, 62, 64, 52/112; column 4, line 64 – column 5, line 12; column 5, line 63 - column 6, line 10) disposed at an angle (32 is at an angle offset from the vertical) over said holder and said opaque defect (column 3, lines 60-65) to direct electrons towards said reactant gas (out of 45; Figure 1) “bombardment, and without ion implantation or knock-on of atoms” – “methods of gas-assisted etching using an etching gas including bromine” (abstract) – claim 1, 25. It is noted that when the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01).
- vii. DUV/EUV mask / substrate (column 1, lines 35-45)
- viii. Chrome opaque defect (column 3, lines 3-4; line 55)

---

<sup>3</sup> Baum, Aaron Wolf et al (US 5,684,360 A) teaches the art-accepted definition of “electron beam column” (column 6, lines 30-35)

- ix. An ion focusing control system (18; column 4, lines 28-44) and scanning control system (62, column 4, lines 39-43) – claim 9
- x. An acceleration system (“JEOL Model 6400”) providing a low acceleration voltage (column 9, lines 20-25) – claim 11
- xi. A computer controller (50, 52/112, column 4, lines 38-45; column 7, lines 33-44; column 5, line 63 - column 6, line 10; column 7, lines 32-44) adapted to control the second electron column delivery system (32, 54, 56, 62, 64, 52/112; column 4, line 64 – column 5, line 12; column 5, line 63 - column 6, line 10) – claim 10, 12.
- xii. The gas delivery system (34; column 5, lines 22-38) is also adapted to “dispense a carrier gas towards said opaque defect”, “said gas comprises water or oxygen” (claim 29), “said gas comprises Xenon Fluoride (XeF2)” (claim 30) – Applicant’s claim 18, 29, 30 limitations are intended use claim requirements. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey,152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).
- xiii. Applicant’s claim 20 limitation of “the reactant gas absorbs to said opaque defect and becomes disassociated” are intended use claim requirements. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention

generally will not limit the scope of a claim (Walter, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP 2111.02).

Casey does not teach that Casey's first electron column (28; Figure 1; column 3, lines 8-16, "image and mill the workpiece"; column 4, lines 5-10; column 5, lines 5-10) is used to direct a first set of electrons towards a substrate.

Casey does not teach that Casey's second electron column delivery system (32, 54, 56, 62, 64, 52/112; column 4, line 64 – column 5, line 12; column 5, line 63 - column 6, line 10) is capable of "scanning".

Casey does not teach Casey's computer controller (50, 52/112, column 4, lines 38-45; column 7, lines 33-44; column 5, line 63 - column 6, line 10; column 7, lines 32-44) adapted to control the second electron column delivery system (32, 54, 56, 62, 64, 52/112; column 4, line 64 – column 5, line 12; column 5, line 63 - column 6, line 10) can control Casey's second electron column delivery system (32, 54, 56, 62, 64, 52/112; column 4, line 64 – column 5, line 12; column 5, line 63 - column 6, line 10) "dwell time", "scan rate", "refresh time", and "retrace time" because Casey does not teach that Casey's second electron column delivery system (32, 54, 56, 62, 64, 52/112; column 4, line 64 – column 5, line 12; column 5, line 63 - column 6, line 10) is capable of "scanning". However, Casey's computer controller (50, 52/112, column 4, lines 38-45; column 7, lines 33-44; column 5, line 63 - column 6, line 10; column 7, lines 32-44) is inherently

capable of controlling “dwell time”, “scan rate”, “refresh time”, and “retrace time” as evidenced from Casey’s “scan generator element 62”, “dwell registers 64” (column 4, line 40; column 7, line 55 – column 8, line 5), and processor 52/112 “to implement a digital raster pattern” (column 5, line 65). Applicant’s claimed “times” and “rates” of moving are translated to Casey’s control element 58 to generate raster motions which have “dwell time”, “scan rate”, “refresh time”, and “retrace time” based on the desired milling instructions (column 6, lines 1-10; column 7, lines 45-54).

Parker teaches a “highly focused” scanning (“ion beam is scanned”; claim 1, ) electron column (4; Figure 1A; column 4; lines 13-23) used to direct a first set of electrons (10; Figure 1A; column 4; lines 13-23) towards a substrate (“targets”; column 2, lines ) for charge neutralization (claim 1, “second, charge neutralization mode”).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add Parker’s electron column to Casey’s apparatus and to optimize the operation of Casey’s apparatus to avoid damaging underlying layers of the processed substrate.

Motivation to add Parker’s electron column to Casey’s apparatus and to optimize the operation of Casey’s apparatus to avoid damaging underlying layers of the processed substrate is to minimize substrate damage as taught by Casey (column 9; lines 65-67) and for combining multiple beam sources into one apparatus as taught by Parker (column 3; lines 29-31) to image “with high spatial resolution” as taught by Parker (column 3; lines 33-35). Further, it is well established that the duplication of parts is obvious (In re Harza, 274 F.2d 669, 124 USPQ 378 (CCPA 1960) MPEP 2144.04). It would be obvious to those of ordinary skill in the art to optimize the operation of the claimed invention (In re Boesch, 617 F.2d 272, 205 USPQ 215

(CCPA 1980); In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); Merck & Co. Inc. v. Biocraft Laboratories Inc., 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); In re Kulling, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990), MPEP 2144.05).

9. Claims 21-24, 26, 32, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Casey, Jr. et al (USPat. 6,042,738) as demonstrated by Baum, Aaron Wolf et al (US 5,684,360 A) and Fuji, Eiji et al (US 5,876,504 A) in view of Parker; Norman W. et al. (US 4,818,872 A). Casey, Parker, and Fuji are discussed above. Casey, Parker, and Fuji do not teach operating pressures in 0.5-10.0mTorr, “a beam comprising a current of about 0.05-1.0nA”, second electrons beams with diameters of about 5-125nm and energies of 0.-3.0keV. Casey further does not teach that his reactor is either reaction-limited or mass transfer limited as claimed by Applicant’s claim 33 – However, when the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01). Parker further teaches an electron beam apparatus (Figure 7) including operating pressures up to 100picoTorr (column 6, lines 15-20), beam currents of about 1.0nA (column 7, lines 1-10), electrons beams with diameters of about 5-125nm (“not more than 1 micrometer”; column 7, lines 1-10) and energies of 3.0keV (column 7, lines 23-31).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace Casey’s electron emitting column with Parker’s electron emitting column (12; Figure 7).

Motivation to replace Casey's electron emitting column with Parker's electron emitting column (12; Figure 7) is for thin film processing as taught by Parker (column 6, lines 30-41).

***Response to Arguments***

10. Applicant's arguments filed July 28, 2008 have been fully considered but they are not persuasive.

11. Applicant's new arguments are centered on the relative positioning or location of Applicant's component parts whereby relative "heights" of component parts are claimed with respect to one another. Although Casey's drawings appear to teach such a relative claim limitation, the Examiner believes that such claim requirements should be rejected under 112 2nd paragraph on the basis that they are incomplete for omitting essential structural cooperative relationships of elements, where such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. As stated above, the omitted structural cooperative relationship is believed to be some unclaimed datum. The claimed "heights" can be measured from many numerous and arbitrary positions in both the prior art and in Applicant's not-to-scale drawings.

12. With respect to Applicant's remaining arguments, the Examiner has again reconsidered his grounds of rejection and the teachings of both the prior art and Applicant's invention and believes in earnest that such grounds of rejection be sustained for at least the above asserted positions.

### ***Conclusion***

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272-1442. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official fax phone number for the 1763 art unit is (571) 273-8300. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (571) 272-1700. If the examiner

Application/Control Number:  
09/895,511  
Art Unit: 1792

Page 23

can not be reached please contact the examiner's supervisor, Parviz Hassanzadeh, at (571) 272-1435.

/Rudy Zervigon/

Primary Examiner, Art Unit 1792